EMERGENCY EVACUATION PROCEDURES

Important: The Michigan Bureau of Fire Services has adopted new rules for colleges and universities effective 2015

1. Only residence halls are required to hold fire and tornado drills.
2. In lieu of fire drills in other university buildings all faculty and instructional staff are required to do the following on the first day of class:
   - Explain the university fire evacuation procedures to the class (see below).
   - Explain the locations of the primary and secondary exit routes for your class location.
   - Explain your designated safe location where the class will meet after evacuating the building.
3. The class instructor is responsible for directing the class during a building evacuation.

General evacuation procedure:
- Use the nearest safe exit route to exit the building. The nearest safe exit from room 19-104A is the front (south) entrance that is close to the MUB circle. The secondary exit is in the middle of the building, either the west or east entrance (both are equally close).
- Close all doors on the way out to prevent the spread of smoke and fire.
- After exiting, immediately proceed to a safe location at least 100 feet from the building. Our designated safe location is at the mailbox near the entrance to parking lot 12 (near the MUB small parking lot).
- Do not re-enter the building until the all-clear is given by Public Safety or the fire department.
Course Description: An introduction to basic laboratory methods and instrumentation used in the measurement of fluid flow and heat transfer

Skills:
- Lab Safety
- Viscosity, density measurement
- Differential pressure measurement
- Use of control valves
- Fluid flow measurement
- Heat transfer measurement
- Process modeling
- Pumping
- Visio for Piping & Instr. Diagram
- Teamwork
- Good lab practice
- Data presentation
- Statistical analysis/Error Anal
- Report writing
- Computer skills

Course Structure:
- Monday and Wednesday 2pm (lecture/lab)
- Tuesday in lab 9-11am
- Lab groups of two persons; assigned by Dr. Morrison
- Lab reports due, in person, the week after lab session (Wed)
- 6 lab reports (5-10-15%); 8 assignments+1 quiz grade (30%); lab performance (10%)

Lab Materials:
- Bring bound laboratory notebook to lab every lab day starting Tomorrow (Start TOC; tape P&ID sketch into notebook)
- Bring blue or black pen (not pencil)
- Safety glasses are provided
- Do not wear shorts, sandals; follow dress code
Lab handouts are on the class website:  
[www.chem.mtu.edu/~fmorriso/cm3215/cm3215.html](http://www.chem.mtu.edu/~fmorriso/cm3215/cm3215.html)

***If the date on the document is not the current semester, it is likely to be updated in the near future***
Lab groups assigned by instructor
Serve as safety team once or twice in the semester
Station assignment depends on student number assigned in lab

See:
www.chem.mtu.edu/~fmorriso/cm3215/safetyandlabgroups.html

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Email in a Professional Setting

- Include a salutation (Good Morning, Good Afternoon, etc.)
- Include sentences, punctuation
- Leave off emoticons
- Be conscious of tone
- Include units with data
- Sign your name(s), group #
- Avoid attachments, especially if ASCII (plain) text would do
Laboratory Notebook

- Bound – preserves the order of events, keeps things organized
- Cross out pages or items that need to be deleted – do not remove pages
- Use black or blue pen, not pencil (this is meant to be an archival record of your activities; colored inks fade and pencil smudges)

- Produce a table of contents for your laboratory notebook
• Date every page.
• Do all writing in the laboratory notebook (even sketches, reminders, schedules).

• For this class, start all experimental entries with a brief summary of safety issues.
• Initial your entries, especially if more than one person uses the notebook.
• The date is particularly important on data pages.
• Materials printed from the computer can be permanently affixed with tape around all four sides.
• Leave space for future comments, additions.

• Prepare your data-taking tables before the start of the laboratory.
• Give some thought to designing the tables.
CM3215 Fundamentals of Chemical Engineering Laboratory

Letter (memo) of Transmittal

Purpose is to “transmit” an item
Short, simple; gets reasons for submission down on paper

Memo

To: Professor Faith Morrison
From: Silvia Smith
Date: September 4, 2007
Subject: Report on Status of 30-Gallon Reactor

Attached, please find my report on the current status of the 30-gallon reactor in 2001. Per your request of 5 August 2007, we have inspected the instrument and determined what steps are necessary for putting it into service. The details are found in the attached report.

If you have any questions, please contact me at smith@industry.com or 906-487-2050.

Assignment 1: (group assignment)

Create P&ID Diagram for the CM3215 Laboratory Station; you may consult with other groups; submit your own team work
In your cover memo, list all the valves and devices in the path that would direct water from the feed tank, through the ¼” line and back to the discharge tank.

Submit to your results with memo of transmittal (Due this Friday, 9:05am, Homework Box A, 2nd floor ChemSci)
Affix a copy of P&ID in your lab notebook
Affix a copy of unit conversion table to your lab notebook:

www.chem.mtu.edu/~fmorriso/cm310/convert.pdf

Laboratory Orientation
Pre-laboratory Assignment
Review the software MS Visio 2007, which is part of the MS Office suite of software products and is available on laboratory computers.

Introduction
There are several types of engineering drawings that are commonly created in the engineering, design, construction, and operation of chemical processing equipment. Each drawing has a specific purpose and each is necessary to communicate information to others working on the same project.

A block flow diagram is developed during...
Example, guaranteed to be wrong!

Safety

• Laboratory Safety Manual is on the web (PRINT IT)

• You must follow all instructions in the Safety Manual at all times

• Required:
  Wear Safety glasses/goggles
  Name tag

• Prohibited:
  Open-toed and open shoes
  Shorts, skirts
  Eating, drinking, water bottles
  Backpacks on the floor
PAWS Program

- Prevent Accidents with Safety
- Read up on it in Safety Manual
- Goal: prevention
- Report unsafe acts/conditions
- A more in-depth version is followed in Unit Operations Lab

SAFETY TEAM

- Responsible for presenting a summary of safety points at the beginning of a lab day
- Responsible for taking a special interest in hazards and safe operation of all the laboratory stations
- Reviews PAWS reports, follows up on open PAWS reports
- Team must submit separate printed one-page Safety report (memo) to TA (due same day and time as reports) (there is a sample safety report on the website)
Chemical Handling at Michigan Tech

Michigan Technological University follows all national and state laws for the labeling of hazardous chemicals.

Students, faculty, and staff in the Department of Chemical Engineering are required to follow Departmental, University, State, and National rules for safe handling of chemicals.

Hazard Communication Standard

- Provides a common and coherent approach to classifying chemicals and communicating hazard information on labels and safety data sheets.
- Mandates that employers (including Michigan Tech) have a Hazard Communication program that includes:
  1. Chemical inventory
  2. Safety data sheets (SDS) on chemicals
  3. Container labels
  4. Training
  5. A written program that details the above

⇒ Hazard Communication Plan

www.osha.gov/dsg/hazcom/
Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

- International standard (UN sponsored)
- Replaces national classifications/labeling standards
- Began in 1992
- OSHA published the final rule on 26 March 2012 for implementation of GHS.
- Product manufacturers required to adopt the standard by 1 June 2015
- Product distributors required to adopt the standard by 1 December 2015
### Hazard Communication Standard (HCS) Pictograms

- 9 pictograms depict hazards (physical, health)
- Within each hazard, there are multiple categories
- Category 1 is the most severe hazard

The pictograms appear on safety data sheets (SDS) and labels on chemical containers.
Safety Data Sheets (SDS, formerly MSDS)

16 mandated sections:
Section 1: Identification of the substance/mixture and of the company/undertaking
Section 2: Hazards identification
Section 3: Composition/information on ingredients
Section 4: First aid measures
Section 5: Fighting measures
Section 6: Accidental release measures
Section 7: Handling and storage
Section 8: Exposure controls/personal protection
Section 9: Physical and chemical properties
Section 10: Stability and activity
Section 11: Toxicological information
Section 12: Ecological information
Section 13: Disposal considerations
Section 14: Transport information
Section 15: Regulatory information
Section 16: Other information

Acetone
(used for cleaning glassware)
Questions:
- What are the two pictograms for acetone?
- What do they mean for acetone?

SDS are stored in a binder in each lab or online. For CM3215 they are in the binder in lab and on our course website.

Accessing Safety Data Sheets at Michigan Tech

Digital copies of the Safety Data Sheets for chemicals and other hazardous materials used at Michigan Tech are available online through MSDSonline.

- The MSDSonline database can be accessed from:
  - The navigation bar at the bottom of most MTU homepages.
  - Click **MSDS ONLINE** under the NEED TO KNOW column.

- By typing [www.mtu.edu/sds](http://www.mtu.edu/sds) in the address bar of your browser.
- Scanning the QR code at the entrance to laboratories and other rooms where chemicals are used or stored.
- If computer or network systems are not available call 1-888-362-7416 and provide the name of the product and the manufacturer and a FAX number where the information can be sent.
Safety Summary

We have multiple goals, being addressed in parallel:

- Be safe in CM3215 lab
- Learn good safety habits for a lifetime
- Learn about safety practices in use in the chemical industry
- Be part of continuous improvement of CM3215 and Michigan Tech chemical safety programs

Report Writing

- A Team Technical Memorandum report is due for six labs (6 reports, 60%)
  - Report 1 (5%), Reports 2-5 (10%), Report 6 (15%) (no rewrites)
- Be sure to use report feedback to make subsequent reports better
- Grading standards rise throughout the semester

Overarching principle:
You must prepare a report that addresses your objectives.
1. Determine what your objectives are.
2. Address them.
3. Write a report that clearly, and in an organized way, communicates what your objectives were, what you did to address them, and how it turned out.

Overarching principle:
You must prepare a report that addresses your objectives.

Sample report (starting with sample objectives):
www.chem.mtu.edu/~fmorris/cm3215/SampleReport.html

CM3215 Fundamentals of Chemical Engineering Laboratory

Report Writing: Technical Memo Report

5 sections:

1. **Introduction**
2. **Experimental** (Strategy)
3. **Results** (text, graphs, tables, begin error analysis)
4. **Discussion** (discuss your results; expand on error analysis; finish addressing objectives)
5. **Conclusions**

**Introduction**: Explain what your objectives are. Be complete. Do not include anything other than your objectives.

**Experimental**: Describe your experimental strategy for addressing your objectives. Do not repeat or summarize the provided procedure. Do explain what your strategy was in addressing your objectives.

Experimental section is like giving a tour to a visitor
Report Writing (continued)

5 sections:

1. Introduction
2. Experimental (Strategy)
3. Results (text, graphs, tables, begin error analysis)
4. Discussion (discuss your results; expand on error analysis; finish addressing objectives)
5. Conclusions

Results: Present your results; present your equations; introduce your tables and graphs with a narrative. Introduce your error analysis.

Discussion: Discuss your results. Refer back to your tables and graphs and tell the reader what you have discovered as a result of your work. Be quantitative. Anything you want to say in your conclusions must first be discussed here. Finish addressing objectives.

Conclusions: Report on how well you met each of your objectives; be complete; do not introduce anything new. Be quantitative, complete.

Checklist to use before turning in reports:
www.chem.mtu.edu/~fmorris/cm3215/checklist_reports.html

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Report Writing (continued)

• Attach the Basics Checklist to reports 1-4

• Turn report in to TA/Instructor in person on Wednesday at lecture time. First report is due week 3.

• TA/Instructor will immediately check the checklist and return all reports with problems

Explanation of basics violations:
www.chem.mtu.edu/~fmorris/cm3215/BasicsChecklistInstructions.pdf

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Report Writing (continued)

In this class and in your career you will be judged on the clarity and quality of your writing.

- Good grammar and punctuation is a given
- Only include what is needed to make your point (test every sentence — is it needed? Plot out your story.)
- Begin each paragraph with a topic sentence (check before submitting)
- Do not leave out anything that you need to make your point (make sure you back-up your statements)
- Assume the appendix will be separated from the report (it’s for back-up material only)
- Be persuasive — lead your reader along — it is important that they follow your argument

Engineers need to communicate well!

Overarching principle:

You must prepare a report that addresses your objectives.

Every report is different

Writing reports is practice making a thousand decisions

The only way to learn to do this is to do it

The goal is not the production of the report; the goal is the experience of writing the report

The answer to “what goes in this section?” is: “It depends.”

Sample report (starting with sample objectives):

[www.chem.mtu.edu/~fmorriso/cm3215/SampleReport.html](http://www.chem.mtu.edu/~fmorriso/cm3215/SampleReport.html)
Report Writing

Overarching principle:
You must prepare a report that addresses your objectives.

Tip: Check out the Report Feedback Sheet as you prepare your report. Avoid these common mistakes.

www.chem.mtu.edu/~fmorriso/cm3215/ReportGradingFeedback.pdf
www.chem.mtu.edu/~fmorriso/cm3215/ReportGradingFeedbackExplanation.pdf

CM3215 Fundamentals of Chemical Engineering Laboratory

Overarching principle:
You must prepare a report that addresses your objectives.

Note that since the Technical Memo has a memo header, it does not require a separate memo of transmittal.
Summary

- Come dressed for lab tomorrow
- Bring bound lab notebook with table of contents, units page, page numbers, your name
- Print out safety manual and review

Now, on to Error Analysis Lecture 1: Random Error and Replicates